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The Classification of the Archegoniates.

By Lucien M. Underwood.

There has hitherto been much looseness in the coördination of the groups of plants above what have been regarded the natural orders and at the same time wide difference in usage in group names. It is equally apparent that in some respects the botanists have followed a different system of nomenclature from the zoölogists, and they have not even followed a uniform or consistent system among themselves. While it is not possible to crowd a series of forms within the limits of a rigid classification, or accurately coördinate all natural groups of plants in equally related categories, it certainly is possible to follow certain broad principles and maintain a uniformity of nomenclature for the higher groups as well as for genera and species. Leaving particulars for further discussion there ought to be no difficulty in securing the adoption of the following system of group names and sequences:

- Sub-kingdom.
  - Class.
    - Order.
      - Family.
        - Genus.
          - Species.

This is in skeleton the exact usage of the zoölogists and conforms more nearly with the greater portion of the more recent usage among those whose work is connected with cryptogamic botany. The differences that have been most prominent have arisen among the phanerogamic botanists, and some of the differences have even become almost hoary-headed from long usage. Indeed incipient baldness marks not a few of them, and perhaps a proper ventilation of some of the remainder will cause this to become even more apparent.

1. In place of the term *sub-kingdom*, so generally used by zoölogists, the term *series* has been used. The use of the former

must eventually be followed by all who deal in taxonomy, if consistency is to be maintained.

2. There has been a standing confusion of the terms *order* and *family*. The term "natural order" has a considerable antiquity, but has been confined Slargely to the Spermatophytes. While cryptogamic botanists have by no means been uniform in their terminology, they have in the majority of instances clearly distinguished these two group names. In this they have followed the lead of the zoölogists, for there would be no opportunity in animal classification to confound such distinct group names as the *order* Carnivora and the *family* Canidae. And yet the Ranunculaceae have been called indiscriminately a natural order (or simply an order) and a family. On account of this general confusion among the plants which are popularly the best known, it will be all the more difficult for a time to introduce a uniform and consistent system. And yet it seems to need no argument to show that there is no good reason for perpetuating this confusion in our terminology, and the stand taken on this point by the German systematists, and quite consistently carried out in a number of the most elaborate floras that have ever appeared in any country, will go far toward establishing the correct terminology.

3. There has also been a tendency to use the term *cohort*, much as we have used the term order in the proposed system. This was introduced by Lindley, and its adoption by Bentham and Hooker has had the tendency to fix its use especially in those quarters where other emanations from the same source have had much weight. As the Spermatophytes are not all of the vegetable world and much less not all of the domain of living things, it becomes a question when we broach the matter of uniformity of usage as to whether we shall follow a generally established principle or merely a localized usage. Since all zoölogists and the great majority of cryptogamists have already established the term *order* to include a group of families, it would seemingly be folly to attempt to adopt the term *cohort* in place of the term *order*. Here priority of use might well be argued in addition to the axiom that a part is not more important than the whole.

The adoption of intermediate groups such as sub-classes, sub-orders, sub-families and sub-genera can well be left to monographers of special groups, for their necessity will evidently vary in every group of plants. It would be a consummation devoutly to be wished if their use anywhere were restricted as much as possible, for a too extended and minute subdivision is not only not demanded by most groups of organic forms, but when introduced in excess tends more to confusion than otherwise and often obscures the real groupings of allied forms.

So far as uniformity of termination is concerned it would seem that the termination-*ales* could properly be adopted for orders and the termination-*aceae* for families where this would not interfere with long established names. In this connection uniformity would seem to be of more importance than priority, especially as the limitations of these larger groups have been so long a matter of uncertainty and variety of opinion. In the groups above orders, there would seem to be less necessity for uniformity of termination than in the orders and families themselves.

In order to illustrate the matter of uniformity of terminology and as a contribution toward securing this uniformity, I present the following arrangement of the sub-kingdom known as Archegoniata. It will be necessary as an introduction to state the limitation of that group as we understand it. In the present condition of our knowledge of plant forms, we can probably find no more satisfactory primary division of the plant world than the following, though of course we are still very far from a natural arrangement. It is practically the arrangement followed in the Engler-Prantl series* with minor modifications.

Sub-kingdom MYCETOZOA.
Sub-kingdom THALLOPHYTA.
Sub-kingdom ARCHEGONIATA.
Sub-kingdom SPERMATOPHYTA.

A few remarks may be to the point in explanation of this division, which in its lower half is necessarily artificial and unsatisfactory.

1. The slime moulds are evidently sufficiently distinct from other plants to warrant a separation in this way. That they have undoubted affinities with the animals no one can doubt, but it is equally clear that they have decided affinities with at least two

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* Die natürlichen Pflanzenfamilien, 2: 1, 1–2.

groups of plants, the bacteria and the moulds (Mucorini), that cannot be disregarded. While their structure and function causes them to stand somewhat midway between plant and animal, it would seem more consistent in a systematic arrangement to place them at the bottom of the plant world.

2. Until the inter-relations of the algae and fungi can be more definitely known and some suitable system devised that shall make it possible to unite allied forms on a rational basis, it will be best to maintain this unnatural and heterogenous group which we call Thallophyta. It is true, as has been stated, that the group is practically undefinable, but that is always true of the last division of any series in which those forms are placed that do not conform to any known natural arrangement. The close alliance of some of the lower fungi and algae absolutely precludes the idea of establishing these as primary groups, and of the various systems of subdivision that have been maintained there are none that seem to be founded on real or natural relationships. Unsatisfactory as the group is, we see no present improvement that can replace it.

3. As has been often maintained, there is not a wide distinction between a simple *Riccia* and some of the green algae, and the group Archegoniata is not entirely distinct at its lower limit. This, however, is true of any great group when its outliers are all known, for evolution has not yet resulted in the destruction of all the connecting links. We have for the same reason excluded the Characeae from this group because of their apparently stronger affinities with the other green algae. For a similar reason we have included the Gymnosperms at the upper limit because their affinities when properly understood seem to link them more strongly here than with the higher plants.

With these limitations we present the following outline of the classification of the Archegoniata.

Sub-kingdom ARCHEGONIATA.
  Class BRYOPHYTA.
    (*Sub-class Hepaticae.*) *
      Order Marchantiales.

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* I have placed these subgroups in parenthesis as representing group names that modern research seems destined to retire to a merited oblivion. I have elsewhere discussed their abandonment more in detail. *Cf.* Proc. A. A. A. S. 43 : 259–274, 1894.

Family RICCIACEAE.
Family MARCHANTIACEAE.
Order Jungermaniales.
Family METZGERIACEAE.
Family JUNGERMANIACEAE.
Order Anthocerotales.
Family ANTHOCEROTACEAE.
(*Sub-class Musci.*) *
Order Sphagnales.
Family SPHAGNACEAE.
Order Andraeales.
Family ANDRAEACEAE.
Order Archidiales.
Family ARCHIDIACEAE.
Order Bryales.
(I omit the somewhat numerous families of this order as unnecessarily extending this illustration.)
CLASS PTERIDOPHYTA.
Order Filicales.
Family OPHIOGLOSSACEAE.
Family MARATTIACEAE.
Family HYMENOPHYLLACEAE.
Family OSMUNDACEAE.
Family SCHIZAEACEAE.
Family GLEICHENIACEAE.
Family POLYPODIACEAE.
Family CYATHEACEAE.
Family MARSILEACEAE.
Family SALVINIACEAE.*
Order Equisetales.
Family EQUISETACEAE.
Family CALAMARIACEAE (fossil).†
Order Sphenophyllales.
Family SPHENOPHYLLACEAE (fossil).†
Order Lycopodiales.
Family LYCOPODIACEAE.

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* See foot-note on preceding page.

Family PSILOTACEAE.
Family LEPIDODENDRACEAE (fossil).[†]
Family SIGILLARIACEAE (fossil).[†]
Family SELAGINELLACEAE.
Family ISOETACEAE.[‡]
CLASS GYMNOSPERMAE.
Order Cycadales.
Family CYCADACEAE.
Order Cordaitales (fossil).
Order Pinales.
Family PINACEAE. (*Coniferae.*)
Order Gnetales.
Family GNETACEAE.

The above classification is not proposed from the fact that it contains anything especially novel, but is merely an adaptation of the principle of uniformity in the terminology of the lower groups. So far as unlike things can be compared at all, the above families, as indicated, are groups equivalent with the so-called "natural orders" of the higher plants, e. g. *Ranunculaceae*, *Liliaceae*, *Orchidaceae*, etc.. The separation of the Gymnosperms entirely from the Spermatophytes will doubtless jostle with the ideas of those who still sandwich them in between the Monocotyledons and Dicotyledons, unaware of the modification that has taken place in our ideas of homology in the past two decades, while they have been asleep and failed to note the march of progress over their heads. In some instances it may be desirable to introduce a few subdivisions, but in the above I have purposely left them out except in one instance, that the simplicity of the arrangement might be the more apparent. They should not appear except for sufficient and well founded cause.

GREENCASTLE, INDIANA.

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[*] No lineal series of these families can represent their true affinities.

[†] The position of many of these fossil forms is still problematical.

[‡] The position of this family is by no means permanently decided.